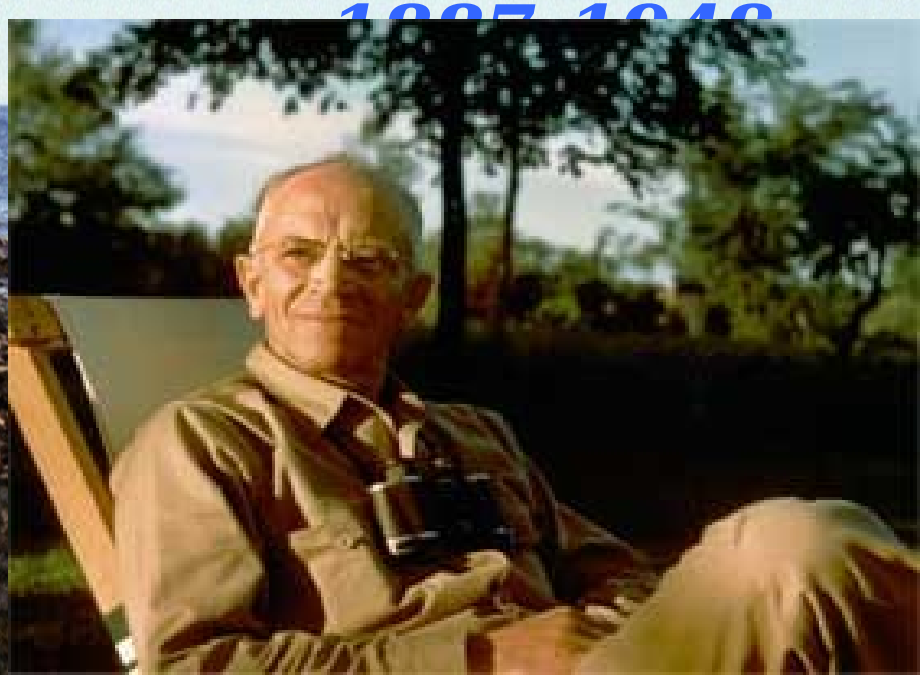
Introduction to Ecological Assessment

"To keep every cog and wheel is the first precaution of intelligent tinkering."

Aldo Leopold



Ch 6 Mod 1
HO # 14 & 14a

Learning Objectives for Chapter 6

To introduce:

(1) Basic concepts of ecological assessments

(2) Array of potential methods

(3) How methods work and their required inputs

(4) Breadth of activities in doing assessments

(5) Model certification

(6) Cost-Effectiveness and Incremental

Module Objectives

- Basic concepts
  - Significance
  - Structure and function
  - Biology links to hydrology/geomorphology
- Corps Mission!!
- Why measure change?
- Methods and models

Basic Concepts

- Ecological Assessment: the act of identifying, characterizing, or measuring ecological functions of various habitat types

What has changed?

- What are you comparing?

Without project condition vs. with project condition for multiple alternatives

- Does the change impact a significant resource?

- How do we define significance?

Types of Resource Significance

- Institutional
- Public
- Technical / Scientific

DETERMINING RESOURCE SIGNIFICANCE BY THE BOOK

- Review and Evaluation of Programs for Determining Significance and Prioritization of Environmental Resources, IWR Report 94-R-7
- Resource Significance: A New Perspective for Environmental Project Planning, IWR Report 95-R-10
- Significance in Environmental Project Planning IWR 96-R-XX
- Resource Significance Protocol for Environmental Project Planning, IWR Report 97-R-4

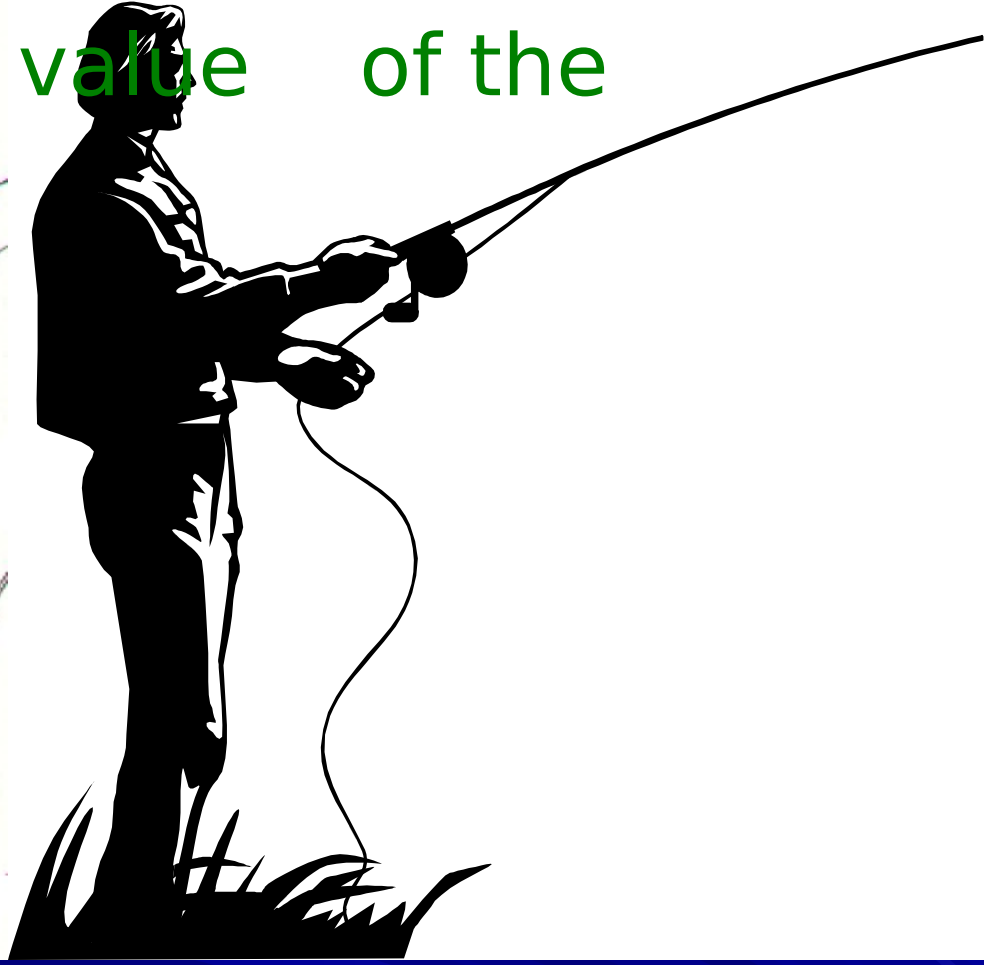
Scales of Resource Significance

- Local
- Tribal
- Regional
- State
- National
- International

From Resource Significance to Assessment

- We have an action
- The environment will be changed by the action, and the changes are determined to be to significant resources
- Benefits and losses we anticipate from the action are t be measured

What do we mean by value of the resource?



Function: The biological, physical, and chemical processes occurring in natural systems.

e.g. provide fish and wildlife habitat, cycle nutrients.

Outputs are measurable!!!!

Value: Values are society's perception of worth (depends whom you ask and often when).

Public significance can change over time

In 1850, what was the value of a wetland?

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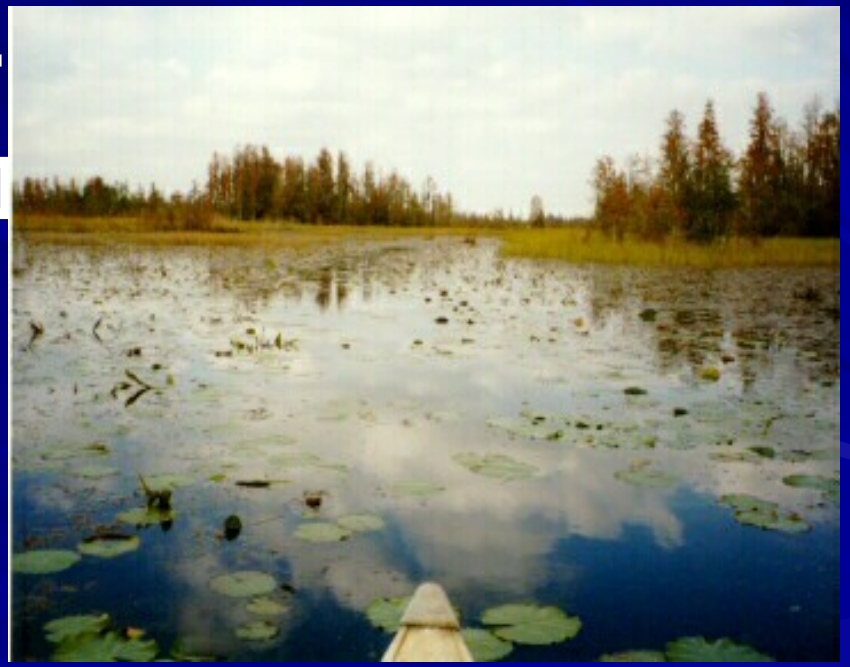


Determine A Value Of Outputs

Functions *and* Values

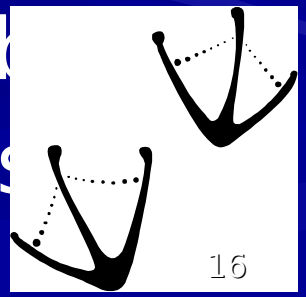
- Fish and wildlife habitat
- Water quality improvement
- Hydrologic functions (e.g. flood storage)
- Shoreline erosion protection

- Recreation, aesthetics, and education $
- “Biological supermarkets” $
- Food: hunting, fishing, vegetables $
- Fossil fuel (e.g., peat) $
- Timber $

What quantifiable variable aside from $ can we use to asses the value of these functions?

Structure versus Function

- Drivers of functions can be traced to physical structure
- Relationships exist between structure and function and can be expressed mathematically
- Measurements of structure can b
  used as surrogates for function



Structure: The pattern and or composition of physical components of the landscape.

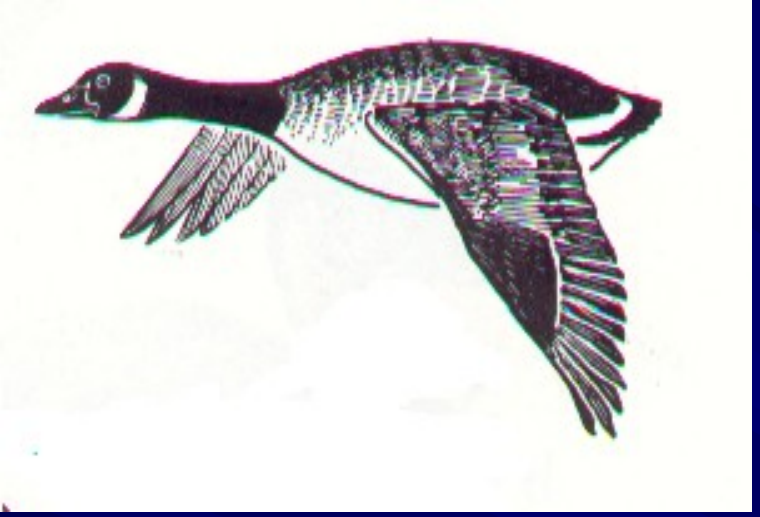
Landscape Scale

Cape May Villas, Philadelphia

Montauk Point, New York

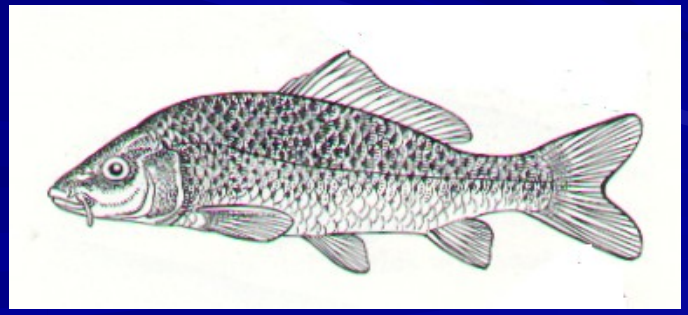
At a project scale!!

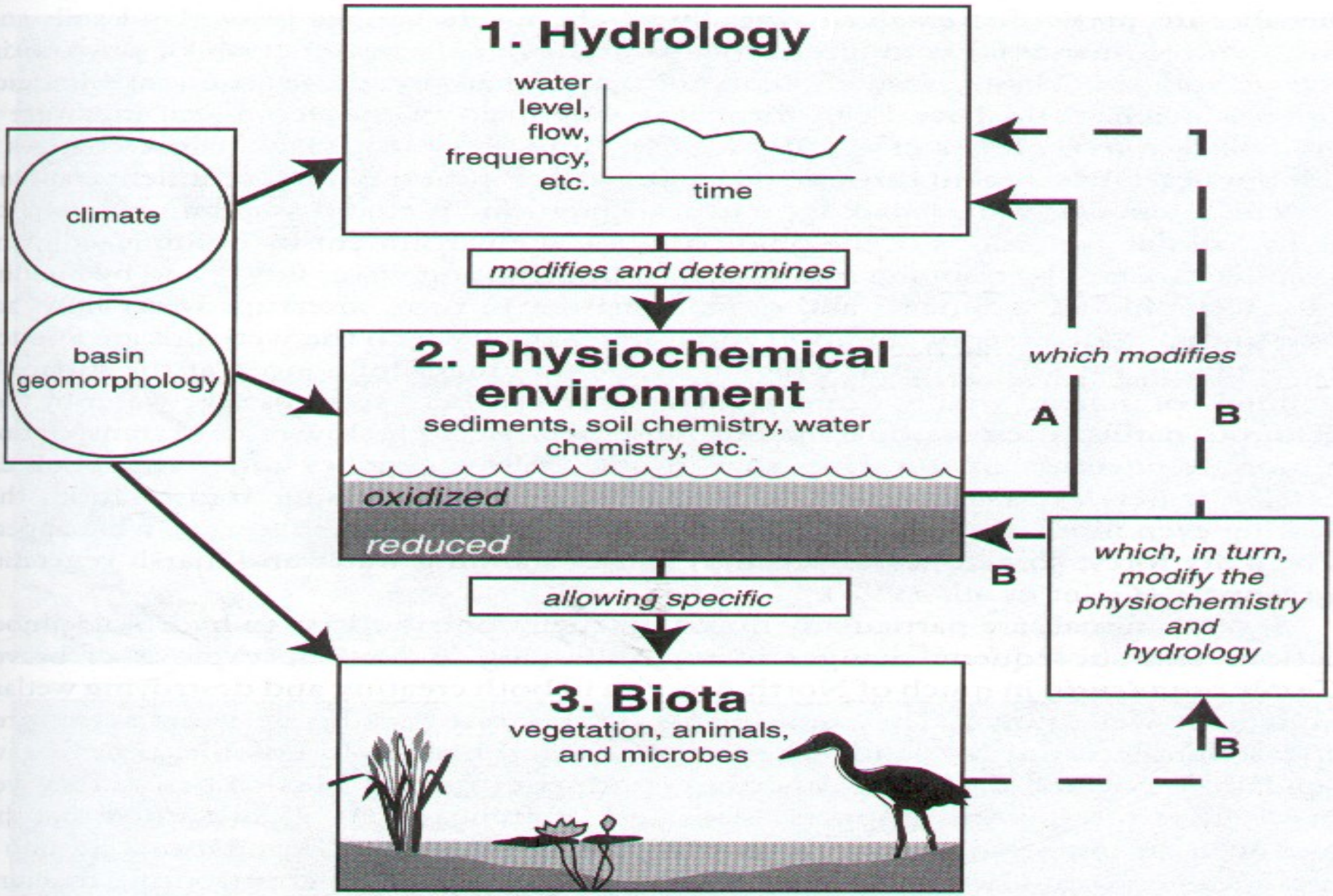
And on a seasonal basis!



What else would you expect to influence ecosystem function?

- Hydrologic and geomorphic conditions affect physiochemical factors (e.g., nutrient availability, chemical structure).
- Physiochemical factors can determine biota
- Biota can alter hydrology (and other physiochemical factors).





Note land morphology may itself be affected by biotic activity.

Definitions

- Hydrologic Character: The occurrence, distribution, movement and balances of water in ecosystems; the seasonal patterns of a river's flow. "The where and why of water"

- Geomorphic Condition: The configuration of landforms, including their origin and evolution, and the processes that shape them.

- ***"Hydrology is probably the single most important determinant of the establishment and maintenance of specific types of wetlands and wetland processes."***

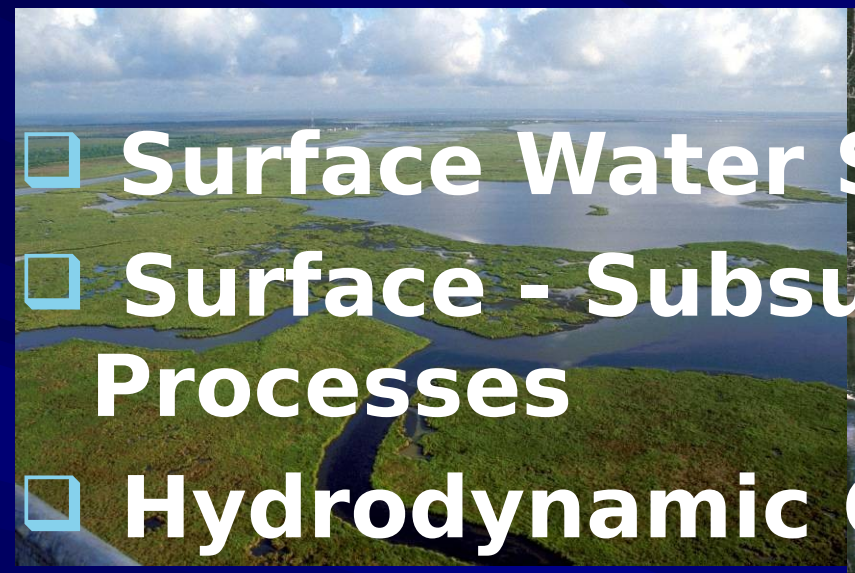
Mitsch and Gosselink 2000. Wetlands 2nd Edition

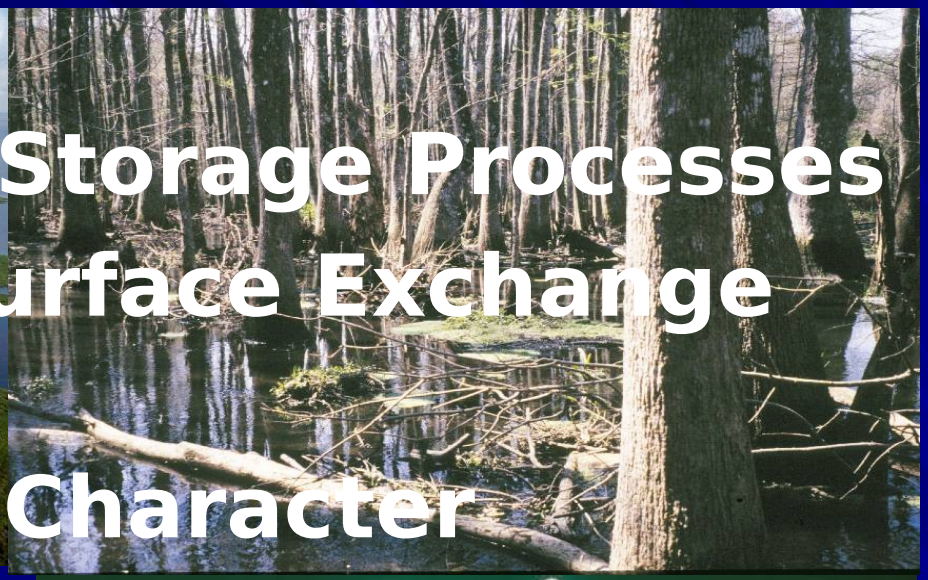
- ***The geomorphic configuration of landforms, including their origin and evolution, and the processes that shape them are also critical.***

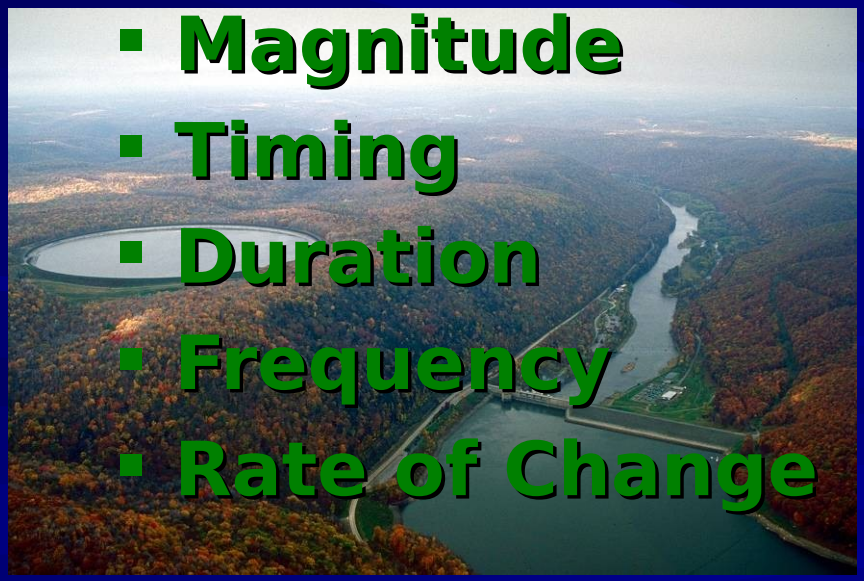
Fischenich, 2008

Hydrologic Character

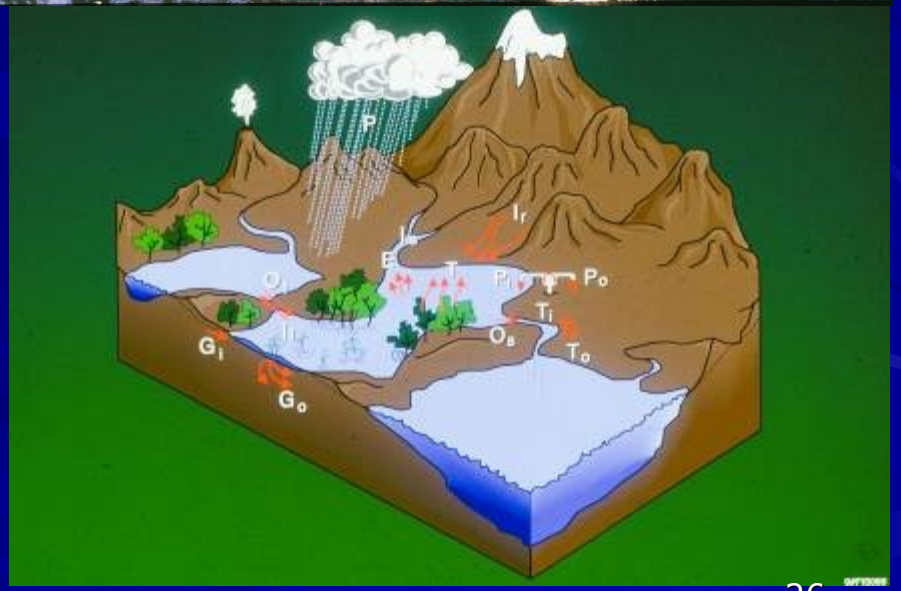
- Surface Water Storage Processes
- Surface - Subsurface Exchange Processes
- Hydrodynamic Character







- Magnitude
- Timing
- Duration
- Frequency
- Rate of Change

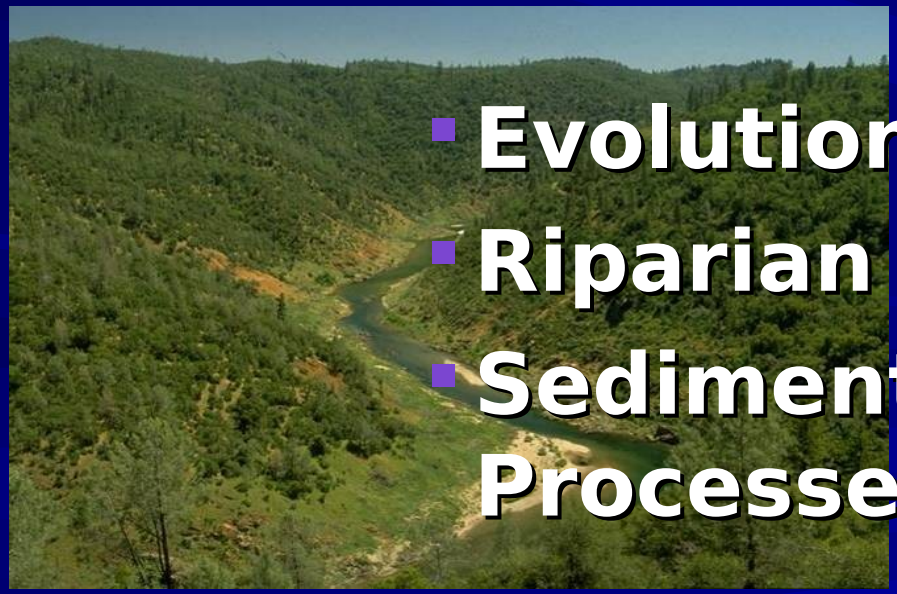


Hydrologic Character

- This character recognizes the importance of appropriate hydrology in maintaining the ecological functions of aquatic, wetland, and riparian systems.
- The hydrologic character refers to the timing, magnitude, duration, frequency, and rates of change of the flows, water levels, and surface/subsurface exchange processes, or again the were and why of water!
- Projects that restore and sustain the natural hydrologic “signature” of a system are more likely to provide sustainable environmental services.

Geomorphic Condition

- Form and Structure
- Landscape Position
- System Dynamics

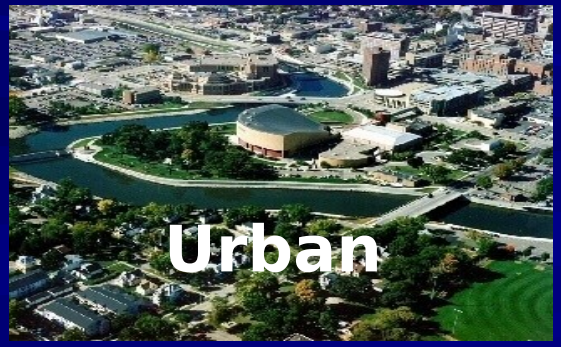


- Evolution Processes
- Riparian Succession
- Sedimentation Processes

Geomorphic Condition

- This character characterizes suitable land structure and physical processes for successful restoration.
- The scale, form, and landscape position of the system/site, along with such factors as erosion, sediment transport and deposition play a critical role in defining ecosystem health and resilience and must be considered in project development!
- The term “System” would apply to large-scale projects such as Everglades or projects with a substantial geomorphic impact on distinct areas.

Varied habitat types where changes to hydrological and geomorphic processes can modify ecological outputs!



Why is hydrology and geomorphology important to the Corps of Engineers?

What landscape features does the Corps focus on to implement solutions to water resource problems?

Can other actions solve those problems?

Do other agencies have a similar focus?

Why Measure Change?

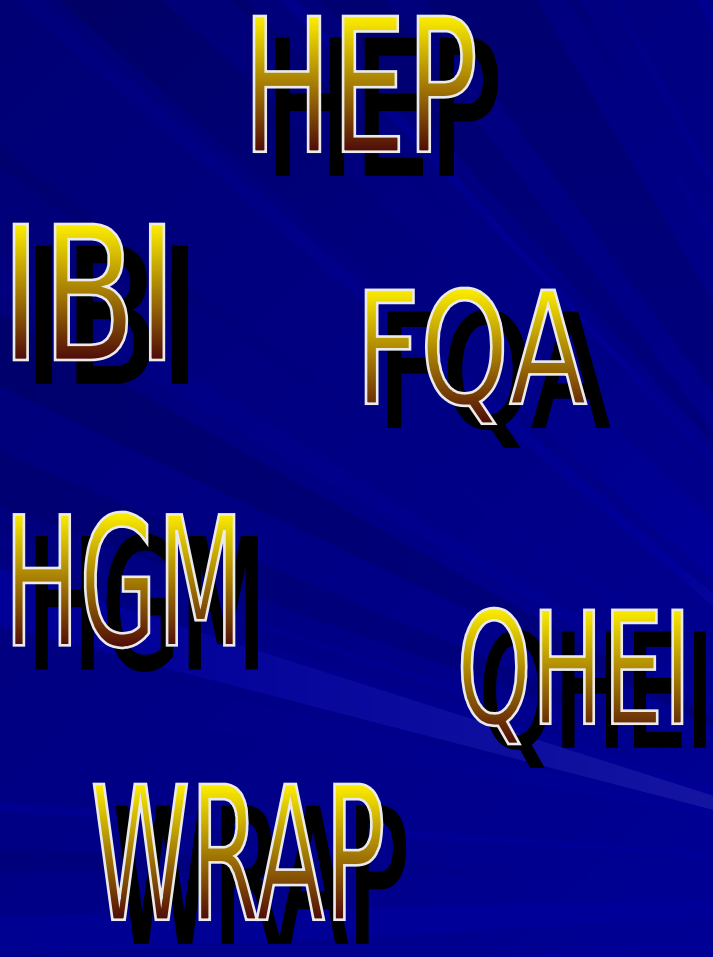
- To assess function/structure, value, etc.
  - By measuring the net quantity and/or quality of desired ecosystem *outputs* expressed quantitatively in physical units or as an index
- Why is this task necessary?
  - Impact analysis/mitigation/restoration
  - In support for Incremental Cost Analysis
  - Alternative selection
  - Budget ranking
  - Monitoring of ecological change
- Support Modular Tools

How to Measure?

- Structural components of the environment are readily measurable
- Physical measurements of functional outputs often are used in more complex trophic modeling.
- Common methods and measurements
  - HEP = Habitat Units
  - HGM = Functional Capacity Units
  - FQA, IBI = Population counts, species diversity
  - Or Specific criteria such as Water Quality parameters: salinity, pH, turbidity

What are Methods?

- A means or procedure especially a regular and systematic way of accomplishing something
- The procedures and techniques characteristic of a particular discipline or field of knowledge:
- SYNONYMS: techniques, tool, process, *system, routine, manner, mode, fashion, way.*



Take Away Points

- Pay attention to the significance and value of your resources
- Measure change by assessing function/structure, value, etc as ecological outputs
- Remember landscape hydrology and geomorphology interact with biology
- Methods and how they are used to complete assessments are many and adaptable for a multitude of outputs.

Questions?